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Indigenous use of plants in south-eastern Australia

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Abstract

The removal of Indigenous people from their traditional lands in south-eastern Australia has rendered it necessary to collect much of the information about plant use from nineteenth century sources. Despite these difficulties, a fully referenced database of species occurring in Victoria which have known Indigenous use in some part of Australia contains over one thousand entries, approximately one third of the total native flora in the state. Databases have been assembled also for New South Wales, Tasmania and the higher rainfall areas of South Australia. They contain plants used for food, medicines, fibre, implements, adhesives and cultural purposes.

Underground storage organs constituted the major food source in higher rainfall areas, whereas seeds become more important in the arid lands. *Microseris lanceolata* (Walp.) Sch. Bip., and *Microseris scapigera* (Forst.) Sch.Bip., Murnong or Yam Daisy, widely used for food, present an interesting taxonomic and biogeographic study.

Introduction

Aborigines populated the south-eastern parts of the Australian continent at least 40,000 years before present. They depended on the use of the native flora and fauna for all of life's necessities, and their continued survival in Australia is evidence that they achieved a balance between exploitation and renewal of the resources. Since fire was regularly applied to significant parts of the landscape, there is no doubt that many of the patterns of biodiversity encountered by the European invaders were of Aboriginal creation. In setting high biodiversity as a goal of present-day management, this is not always acknowledged. (Gott 2005)

Methods

Since in south-eastern Australia Aboriginal people were soon displaced from their traditional lands and confined to reserves (Christie 1979), records of plant use often

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rely on European sources such as nineteenth century books (Smyth 1876), (Dawson 1881), (Curr 1886), and unpublished documents. Exact identification of species is sometimes difficult, but Smyth contains several lists of plants identified by Mueller. Knowledge of plant use still remains in Aboriginal communities and has been freely given (Mason unpublished, and many others). It has been possible to compile extensive Filemaker Pro databases of species for which there are records, written or oral. (Gott unpublished). These cover, separately, Victoria, New South Wales, Tasmania and the higher rainfall areas of South Australia and contain plants used for food, medicines, fibre, implements, adhesives and cultural purposes. Table 1 shows the number of species with recorded Indigenous use for the above purposes in New South Wales. Totalling all databases, there are 513 records covering approximately 1511 species. Copies are held by the Australian National Botanical Gardens, the Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra, and other organizations and individuals. This present paper deals with only a few examples of the utilised species or genera contained in the databases. For further details on the use of plants in Victoria see Gott (1993).

Table 1. Number of NSW plant species with recorded Indigenous use. From Gott (unpublished) NSWUSE database. Note that many species had more than one use.

Food	Medicine	Fibre	Implement	Adhesive	Other(incl. cultural uses)	Total
1248	496	159	260	103	260	1479

Food Plants – "roots"

Despite a popular view of hunting as the major food source, foods of vegetable origin were important in the diet (Gott 1982) and were always the fallback foods, gathered mainly by women and children.

In the higher rainfall areas of southeastern Australia, plant underground storage organs -"roots" in the broad sense - constituted the staple foods. The advantage of "roots" as staples is that they were available virtually year-round. William Buckley, the so-called 'wild white man' was a convict who escaped from the abortive settlement at Sullivan's Bay near Sorrento, Victoria, in 1803 and lived with the Wathaurong tribe around Geelong until 1834 (Morgan 1852). Throughout his account of life with the Wathaurong he constantly refers to 'roots' as the staple food, and this is borne out by many later observers.

' *their natural food consists of the meat of the country when they can kill it, but chiefly roots*' (T. Winter 1837 in Bride 1898).

'*They depend for food almost entirely on animals and roots*' (Dawson 1881)

The main sources of 'root' staples were small herbaceous perennials – geophytes that relied on underground storage to survive the dry hot summers, and some aquatics (Table 2). In the lower rainfall areas of south-eastern Australia and in the arid centre, seeds were more important as staples (Fig.1). Most of the species store carbohydrate in the roots as starch with amylose and amylopectin in varying proportions. However, some common Liliaceae sens.lat. (*Arthropodium, Bulbine, Caesia, Thysanotus* species)

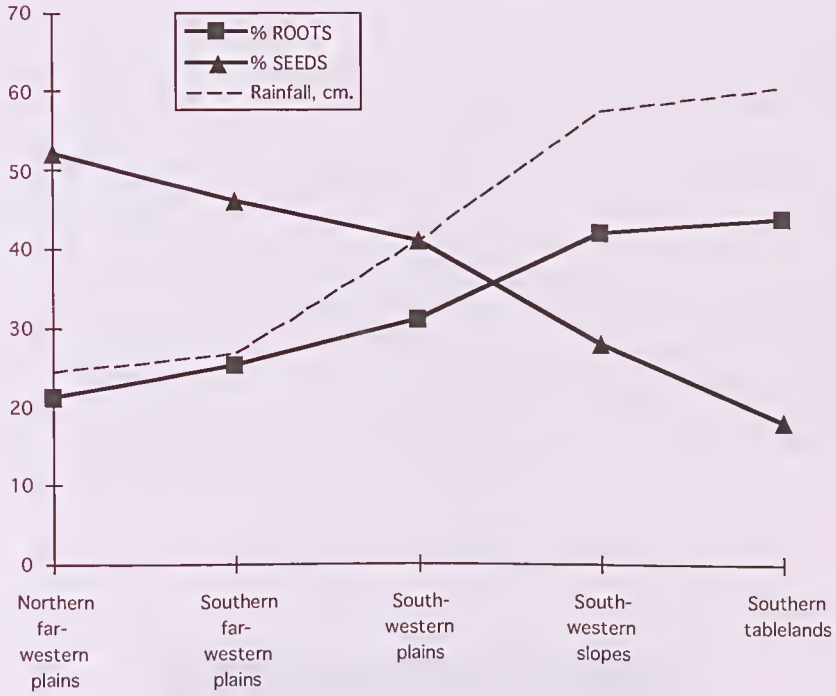

Fig. 1. Percentage of food plants providing roots and seeds from selected botanical divisions of New South Wales (source – Gott B. NSWUSE database).

and the most frequently mentioned Victorian staples, *Microseris lanceolata* and *M.scapigera*, store fructans – polymers of fructose (Table 2.) (Incoll et al. 1989). The occurrence of large amounts of fructans in pre-European Aboriginal diets could have implications for the high susceptibility of Aborigines to develop type 2 diabetes on European diets, which for them were exclusively starch-based (O'Dea 1986), (Englyst & Hudson 1997).

Of the several *Arthropodium* species, the most impressive is the informally named '*Arthropodium* species A' (Conran et al. 1993) (='*Arthropodium* species 1' of Conran 1994), found in alpine areas of New South Wales and Victoria. The tubers, which persist for more than a year, are particularly large and numerous (Fig. 2) and would have been available to tribes who frequented the high country in summer to feast on Bogong Moths, *Agrotis infusa* Boisduval. This *Arthropodium* species flowered spectacularly after the recent 2002–03 fires in the Kosciuszko National Park (New South Wales).

Although individual orchid species are rarely mentioned in historical records, orchid tubers as a general class were recorded as food; indeed they are still eaten in Europe (Kunkel 1984). The starch in orchid tubers is high in amylopectins, which would contribute to a relatively high Glycaemic Index. Some starch-containing roots such as *Pteridium esculentum* (G.Forst.)Cockayne and *Geranium* species would have been processed to break up the fibre content.

Table 2. Some food plants used for their "roots"

Family	Species	Storage Carbohydrate
Anthericaceae	*Arthropodium* spp.	fructans
Asphodelaceae	*Bulbine* spp.	fructans
Asteraceae	*Microseris lanceolata*	fructan (inulin)
Colchicaceae	*Burchardia umbellata*	starch
Colchicaceae	*Wurmbea* spp.	starch
Cyperaceae	*Bolboschoenus* spp.	starch
Dennstaedtiaceae	*Pteridium esculentum*	starch
Geraniaceaez	*Geranium* spp.	starch
Hypoxidaceae	*Hypoxis* spp.	starch
Juncaginaceae	*Triglochin procerum* sl	starch
Orchidaceae	All species	starch, high amylopectins
Phormiaceae	*Caesia* spp.	fructans
Typhaceae	*Typha* spp.	starch

Fig. 2. Tubers of *Arthropodium* sp. A (Conran et al. 1993)/sp. 1 (Conran 1994).

Aquatic Species

Typha domingensis Pers.and *T.orientalis* C.Presl were used widely for food and fibre along the Murray-Darling system and in the Victorian Gippsland Lakes (Gott 1999). The stele of the rhizome is packed with starch and has strong fibrous vascular bundles that were used for string. On the lower Murray River Charles Freneh Angas remarked: '*The staff of their existence is the bulrush root...it is to them what bread is to the European*' (Angas 1847).

Triglochin procera R.Br. and related species have numerous soft root tubers that descend from the rhizome and are able to survive prolonged drought. They were an important food along the Murray River (Beveridge 1889), and were probably eaten all over Australia (Levitt 1982, Specht 1958). The hard corms of *Bolboschoenus* species were eaten after beating between stones. Young shoots and rhizomes of *Phragmites australis* Trin.ex Steud. were eaten by the Tasmanians (Peron F 1802 in Plomley 1983). The stems were most important for spears and necklaces, and well-grown material was traded down from the Murray River to southern Victoria.

Food plants – fruits and seeds

Fruits and seeds are seasonal only (Table 3), but were sometimes stored. Harvesting them would often result in big meetings with neighbouring tribes. An example of this is *Kunzea pomifera* F.Muell. (Fig. 3) which bears clusters of fragrant small pome-like fruits on the sandy coasts of western Victoria and South Australia (Dawson 1881). Along the Coorong the fruit was pounded into large cakes and traded to other tribes (Tindale 1981). It is at present becoming popular in the bushfood industry.

Nitraria billardieri DC. was another very popular fruit (Beveridge 1889) (Fig. 4) especially along the Murray River. It was notable around cooking mounds, presumably growing from discarded 'stones'. *Rubus parvifolius* L., *R.rosifolius* Sm., *Sambucus gaudichaudiana* DC., *S. australasica* (Lindl.) Fritsch and several *Solanum* species were widely eaten. *Solanum vescum* F.Muell. was greatly relished in Gippsland, Victoria (Mueller 1855). It can be managed as a firewced, abundant after fire and disappearing after a few years only to re-appear with the next fire from the soil seed store.

Table 3. Some fruits and seeds used for food

Species	Used for
Acacia, selected spp.	seed ground, also eaten green
Eragrostis spp.	seed ground
Kunzea pomifera	fruit
Macrozamia communis	seed detoxified
Marsilea drummondii	sporocarp processed
Nitraria billardieri	fruit
Panicum spp.	seed ground
Portulaca oleracea	seed ground, stored
Rubus spp.	fruit
Sambucus spp.	fruit
Solanum vescum	fruit

Fig. 3. *Kunzea pomifera* fruits

Fig. 4. *Nitraria billarderi* fruit (both the dark and the light fruits are ripe).

In the drier areas, seeds of grasses were ground for flour, particularly *Eragrostis* and *Panicum* species. Seed of selected *Acacia* species was used; the lipid content of both the seed and the aril vary widely between species (O'Dowd & Gill 1986). *Portulaca oleracea* L. seed was stored for future use (Smyth 1878). *Macrozamia communis* L.Johnson seed required processing to remove toxins (Backhouse 1836). Nardoo, *Marsilea drummondii* A.Braun, is well known as the last food resource used by the explorers Burke and Wills before their deaths in July 1861 while on the Victorian Exploring Expedition. Less well known is that it contains an enzyme which destroys thiamine and may well have contributed to their deaths (McCleary & Chick 1977). For Aborigines it was only a fallback food, and was winnowed to remove the hard spore cases.

Other foods were "greens" from small herbs, nectar from flowers, gum from some Acacias and plant sap from lerp and manna. No sources of plant food were ignored, although some were resorted to only when more preferred foods were scarce. Table 4 lists some plants with uses other than food.

Table 4. Other plant uses.

Species	Use
Acacia dealbata/A.mearnsii	Fibre - bark
Amyema sp.	Medicine - steam bath
Carex tereticaulis	Fibre - stem
Centipeda spp.	Medicine
Duboisia hopwoodii	Medicine
Eucalyptus camaldulensis	Artefact - canoes
Eucalyptus spp.	Medicine - kino
Gynatrix pulchella	Fibre – outer stem
Lomandra longifolia	Fibre - leaf
Mentha australis	Medicine
Pimelea microcephala	Medicine - acupressure
Pimelea spp.	Fibre – outer stem
Xanthorrhoea spp.	Adhesive – resin

Medicine Plants

Records of medicinal plants in south-eastern Australia are less frequent than those from the northern Australian areas, where much traditional knowledge has been preserved (Low 1990, Aboriginal Communities of the Northern Territory 1993). Nevertheless, some northern species also occur in the south-east. Aromatic plants such as *Mentha* spp. (Lamiaceae) and *Centipeda* spp. (Asteraceae) species were widely used medicinally, often against the imported European diseases. Materials with high tannin content, such as Eucalypt kino (sap), were used on burns and wounds. The modern use of transdermal nicotine patches is mirrored by the placing behind the ear of chewed

wads of Pituri, *Duboisia hopwoodii* (F.Muell.) F.Muell., a widely traded source of nornicotine (Watson 1983). Indeed aromatherapy with *Acacia* flowers (Plomley 1966), acupressure with string from *Pimelea microcephala* R.Br. (Koch 1898), steam baths with *Amyema* species (Stone 1911) and the application of medicines in smoke and as body-washes show that Aboriginal medicinal use of plants was varied and well-developed.

Fibre Plants

Fibre was used from a wide variety of species. Coarse string was made from the inner bark of large *Acacia* species and stringybark Eucalypts. *Typha* species were valued for the stelar fibres equally with their use for starchy food. Fine string to make the nets for catching Bogong Moths was prepared from *Pimelea axiflora* F.Muell.ex Meisn. and/or *P.panciflora* R.Br. (Helms 1895). Fine coiled baskets continue to be made from the strong stems of *Carex tereticaulis* F.Muell. and baskets, string and eel traps came from leaves of *Lomandra longifolia* Labill. Buckets were made from whole bark pieces of *Acacia dealbata* Link and *A. mearnsii* De Wild.

Adhesives

A widely used adhesive was the waterproof resin from the leaf bases of *Xanthorrhoea* species. It was gently melted and mixed with fine fibrous material to make it less brittle.

Implements

Wooden implements such as boomerangs, spears, clubs, shields, digging sticks and containers are well represented in Museum collections. From ethnographic accounts and by direct microscopic sections it is sometimes possible to determine the species concerned (Smyth 1876, Kamminga 1988).

Microseris

Microseris lanceolata (Walp.) Sch. Bip., and *M. scapigera* (Forst.) Sch.Bip., Murnong or Yam Daisy constituted the staple food most commonly mentioned in early records (Gott 1983), and were abundant in dry sclerophyll woodlands and grasslands. In 1839 Thomas Mitchell (1839) reported the view over the plains of western Victoria as '*quite yellow with its flowers*' and G.A. Robinson, in north-central Victoria in 1840, referred to '*millions of murnong or yam all over the plain*' (Robinson in Clark 1998). Belonging to the Asteraceae, tribe Lactuceae, its leaves form a rosette, beginning growth in autumn from a stem-base to which are attached one or more soft tubers. New tubers form by the swelling of adventitious roots arising from the axils of the lower leaves. This applies to the 'Murnong' ecotype – see Table 5. For a discussion of the anatomy of the tubers see Gott 1983. At present it is proposed that there are two species, *M.lanceolata* and *M.scapigera* (Sneddon pers. comm. in Vijverberg et al. 2002).

Table 5. *Microseris* ecotypes - after Vijverberg et al. (2002) (No species from Western Australia were included in the study.)

Ecotype	Roots	Pappus	Fertilisation	Distribution
Murnong,M	short to long soft tubers from adventitious roots	scale	non selfing	VIC, NSW, SA
Alpine, A	long +/- tuberous adventitious roots producing new rosettes	scale	non selfing	VIC, NSW
Fine pappus F	Long fibrous +/- tuberous roots	fine	selfing	VIC, TAS, NZ
Coastal C	fibrous	narrow scale	selfing	NZ

The introduction by Europeans of hard-hoofed, close-grazing animals disastrously reduced the abundance of *Microseris*. Within 5 years of the founding of Melbourne it had disappeared from the surrounding area (Dredge1839–1843). Curr, writing of the northern Victorian plains in the 1840's said: *' Several thousand sheep not only learnt to root up these vegetables with their noses, but they for the most part lived on them for the first year, after which the root began gradually to get scarce'* (Curr 1886:240). The result today is that the occurrence of this genus is highly fragmented.

Genetics of *Microseris*

Recent work has suggested that Australian and New Zealand *Microseris* originated from western North America *"An allotetraploid (4x=36) which arose through hybridisation between an annual and a perennial diploid, followed by polyploidisation and long distance dispersal"* (Prober et al.1998) and has undergone adaptive radiation in Australia and New Zealand.

On the basis of genetic studies using chloroplast DNA, and detailed morphological studies, Vijverberg et al. (2002), have described four ecotypes: Murnong, Alpine, Fine pappus, and Coastal (Table 5). Vijverberg et al. conclude that 'the morphological diversification is accompanied by little genetic variation (Vijverberg et al.1999, 2000). '*The taxon is in a relatively early stage of adaptive radiation*' and that the '*process of adaptive radiation and morphological differentiation is progressing*'. They further state that the genetics indicate that '*an unambiguous classification of Australian and New Zealand Microseris is complicated at this early stage of adaptive radiation*'.

Indicative of this situation is that *M. lanceolata* in Flora of Victoria has been split into three informal species (Jeanes 1999).

It must be borne in mind that the populations of the various ecotypes have been long affected by human intervention. This particularly applies to the Murnong ecotype. Its tubers are non-fibrous, and at a shallow depth. As a preferred food for the Aborigines, it was subject to patch burning in late summer at intervals of approximately 3-5 years. This burning, both in dry sclerophyll woodlands and grasslands, ensured the maintenance of open sites for the growth of all the herbaceous perennial food plants (Gott 2005). Microseris and other food plants were also spread widely by trading (Morgan 1852).

The advent of European burning and grazing decimated and fragmented the populations of all the ecotypes, reducing the possibility of genetic interchange. Prober et al. (1998) found that, while isolated populations still retained allele richness, small populations were undergoing gradual genetic decline.

Microseris pollen

Pollen of the Lactuceae is distinct from other Asteraceae, and there are relatively few native species (c.10) that belong to the Lactuceae, including *Microseris* (Table 6). Lactuceae pollen appears in southern Australia during the upper Miocene (McPhail 1999). The possibility of tracing the evolutionary history of *Microseris* by distinguishing its pollen from other Lactuceae has been investigated but did not show promise (G. Crowley, L.Head, B.Gott, unpublished).

Table 6. Members of the Tribe Lactuceae native to South-eastern Australia

Actites megalocarpa	*Taraxacum*, 2spp
Cratystylis conocephala	*Sonchus hydrophilus*
Microseris lanceolata/scapigera	*Sonchus oleraceus*
Picris, 3 spp.	*Youngia japonica*

A final word

Aboriginal people have interacted with the Australian flora for many thousands of years. It is well to bear in mind that the evolutionary history of many of the species used by them may reflect that interaction.

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